COMPUTER ASSISTED LEARNING FOR BIOMEDICAL ENGINEERING EDUCATION: TOOLS

Ayhan İSTANBULLU[1] Yılan GÜLER[2]

[1] Department of Electronic and Computer Education, Faculty of Technical Education, Mugla University, Mugla, Türkiye
[2] Department of Electronic and Computer Education, Faculty of Technical Education, Gazi University, 06500 Ankara, Türkiye

Abstract- Interactive multimedia learning environment is being proposed for development as a learning/teaching aid for biomedical engineering students. Multimedia has attracted increasing attention from all walks of life. It has been proved that multimedia has great impact on educational and industrial development. In this study, some descriptions about Computer Assisted Learning (CAL) are given and some tools used in this area are explained. Together with the developments in the area of distance education technologies, this study can be introduced as a cost effective alternative solution for developing countries in lack of expert teachers and didactic resources.

Keywords - Biomedical Engineering Education, Distance Learning, Computer Assisted Learning, Web Based Training, Tutorial.

I. INTRODUCTION

Computer assisted learning is an area that has become increasingly prevalent in biomedical science. The evaluation of microcomputers and the development of powerful software tools have facilitated the design of computer-based training (CBT) programs [1]. With the availability of multimedia computers, computer-based instruction models that use intelligent simulation, dynamic links (on-line generation of links based on user behavior) and multimedia composition and creation can be developed.

II. COMPUTER ASSISTED LEARNING

In CAL Software, It is distinguished five different interaction types (see Fig.1) presentation; browsing; tutorial dialogue; drill and practice and simulation. In contrast to conventional CBT, there are four architectural types of WBT programs; client based; remote data and knowledge; distributed teaching; and server based. WWW based CAL programs differ from conventional CAL Software; can be stored on data media, installed and used on standalone computers. By contrast WBT programs are based on internet technology, in particular WWW technologies [2].

Computer Based Training (CBT)

Some studies performed were largely on classes using mainframe or mini-computers and performing drill and practice tasks whereas today a variety of courseware is being developed and used in a number of different ways. In the biomedical sciences, for example:

i) Banks of multiple-choice questions with feedback covering specific topics are used for primary learning, self-assessment and revision;

ii) Computer-based simulations of laboratory experiments, particularly in physiology and pharmacology, are used to either better prepare students who will go on to carry out investigations on live animal tissue preparations.

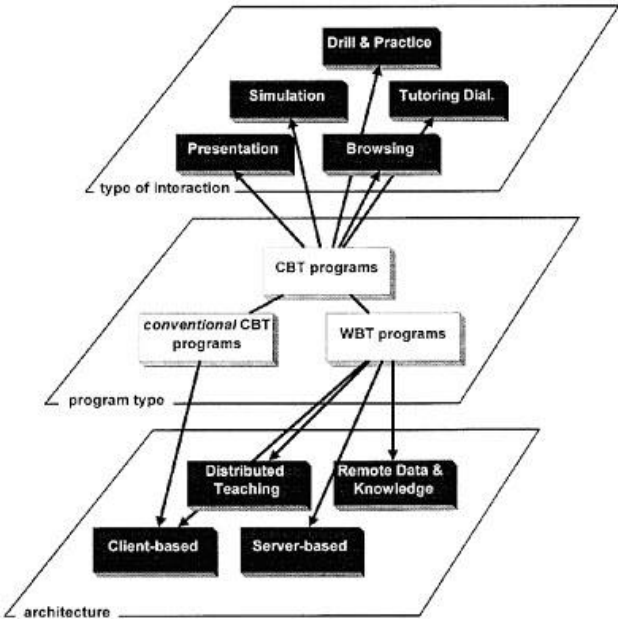


Figure 1. Architectures and Interaction types of CAI programs [3]

iii) Interactive computer-based tutorial programs, which typically combine factual information (presented using text, graphics, animations, video clips) with interactive self-assessment and problem-solving exercises, are used to support or replace lectures or seminars and for revision or self-assessment. [3]

Web Based Training (WBT)

Internet revolution has changed engineering education. Developments in information technology and the World Wide Web (www) have provided exciting new possibilities for distributing information to biomedical engineer.

It permeates nearly every facet of teaching, but little has really changed. An excellent approach to the incorporation of internet resources as teaching tools aimed to develop the skills of senior undergraduate student using the internet and writing documents in html has been developed by Blanchard and co-workers [4]

Distance Learning

Distance education was not invented concurrently with the advent of the world wide web. “Asynchronous” access to resources via the web made it possible to deliver education anytime, anyplace [5].

Report Documentation Page

Report Date	Report Type	Dates Covered (from... to)
25OCT2001	N/A	-

Title and Subtitle Computer Assisted Learning for Biomedical Engineering Education: Tools	**Contract Number**
	Grant Number
	Program Element Number
Author(s)	**Project Number**
	Task Number
	Work Unit Number
Performing Organization Name(s) and Address(es) Department of Electronic and Computer Education, Faculty of Technical Education, Mugla University, Mugla, Türkiye	**Performing Organization Report Number**
Sponsoring/Monitoring Agency Name(s) and Address(es) US Army Research, Development & Standardization Group (UK) PSC 802 Box 15 FPO AE 09499-1500	**Sponsor/Monitor's Acronym(s)**
	Sponsor/Monitor's Report Number(s)

Distribution/Availability Statement
Approved for public release, distribution unlimited

Supplementary Notes
Papers from the 23rd Annual International Conference of the IEEE Engineering in Medicine and Biology, October 25-28, 2001, held in Istanbul, Turkey. See also ADM001351 for entire conference on cd-rom., The original document contains color images.

Abstract

Subject Terms

Report Classification unclassified	**Classification of this page** unclassified
Classification of Abstract unclassified	**Limitation of Abstract** UU

Number of Pages
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Another area that can be benefit from CAL is distance learning, which allows students to work at their own pace and without attending campus. In addition, those who have jobs and are unable to attend a university full-time can work part time, without upsetting their working and personal commitments [6]

III. TOOLS

Authoring Tools

Authoring tool is being considered for the implementation of the interactive multimedia-learning environment, namely Asymetrix Toolbook and Macromedia Authorware 5.x for PC windows or Mac environment. Other authoring tools are seen table 1.

The authoring tools utilized will include either Authorware or Coursebuilder of Dreamweaver extension, leaving open the possibility of creating a World Wide Web application accessible to both full time and part time students. Authorware is specifically intended for designing interactive learning applications. It uses a simple icon-based approach that helps non-technical users produce relatively sophisticated teaching and learning software. Some CAL applications simply present text and images, and can be produced by those with no programming experience. The more interactivity incorporated into the application, the more difficult it will be to produce; although authoring tools, such as Authorware, make this job easier [7].

Other Tools

Macromedia Sound Edit (to edit and blend sound with ages), Apple quick time and Adobe Premier (to incorporate digital video clips for added emphasis).

Animation tools are Macromedia Flash 5.0 and Ulead Gif Animator 3.0. All audio and image materials are assembled in to multimedia compositions by scripting within authoring tools [8].

Standards

IEEE Computer Society has established the Learning Technology standarts Committee (P1484) to develop and standardize protocols and methods so that learning modules can be used by the student/learner in seamless environment, without needing multiple client applications [9].

Prospective Applications

There are numerous applications for this tool which are yet to be explored in Biomedical science;

i. Development of customized programs for instruction and reference.

ii.Patient simulations using a windowing environment rather than multiple screens.

iii.Interactive tutorials on the process control of physiology, anatomy (eg. Nerve simulations) and forensic medicine (finger prints and teeth)

iv-) A fully indexed electronic medical database [6].

Table 1. Examples of some Multimedia CAL Authoring tools [6].

Product name	**Company**	**Metaphor**	**Platform**	**www address**
Authorware	Macromedia	Icons	PC	www.macromedia.com
Toolbook	Asymetrix	Book	PC	www.asymetrix.com
Director	Macromedia	Storyboard	Mac/ PC	www.macromedia.com
Icon Author	Asymetrix	Icons	PC/ Unix	www.asymetrix.com
Click and Create	Corel	Storyboard	PC	www.corel.com

IV. CONCLUSION

Computer Assisted Learning environment proposed for development as a learning / teaching aid for biomedical engineering education. Additional educational support should be provided if the CAL application is to be used to support distance learning.

In the future, computer based interactive multimedia using computer animation will merge as critical tool to assist in the efficient information processing and analysis of greater volumes of education data in biomedical engineering and hence achieving quality mass health care through affordable technology.

We expect a trend from conventional CAL towards WBT programs. Together with the developments in the area of distance education technologies, this study can be introduced as a cost effective alternative solution for developing countries in lack of expert teachers and didactic resources.

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